

AMENDMENTS TO THE CLAIMS

1-65. (Cancelled)

66. (Previously presented) An electron beam system comprising:
an electron gun for emitting an electron beam and for irradiating the electron beam against a sample when the sample is positioned at an irradiation location;
an electron lens for magnifying the electron beam after having passed through the sample;
and
a detector for detecting the electron beam after having been magnified so as to form an image of the sample,
wherein a crossover image of said electron gun is to be formed on or in the vicinity of a principle plane of said electrons lens.

67. (Previously presented) The electron beam system according to claim 66, wherein said electron gun is for irradiating the electron beam against a sample by irradiating the electron beam against a stencil mask or a mask having a pattern formed on a membrane.

68. (Previously presented) The electron beam system according to claim 66, further comprising:
an NA aperture disposed between said electron gun and the irradiation location such that when said electron gun emits the electron beam the electron beam is passed through said NA aperture so as to allow a well-collimated electron beam to be irradiated against the sample.

69. (Previously presented) The electron beam system according to claim 66, further comprising:
a single shaping aperture disposed between said electron gun and the irradiation location such that when said electron gun emits the electron beam the electron beam is passed through

said single shaping aperture and irradiated against a surface of the sample so as to allow an image of said single shaping aperture to be formed on the surface of the sample.

70. (Previously presented) The electron beam system according to claim 66, further comprising:

an optical axis; and

shaping apertures disposed in the vicinity of said optical axis, with an overlapping arrangement of said shaping apertures being changeable so as to make variable an area on the sample to be irradiated by the electron beam when emitted from said electron gun.

71. (Previously presented) The electron beam system according to claim 66, wherein said electron gun has a thermionic emission cathode and is operable under a space-charge-limited condition.

72. (Previously presented) The electron beam system according to claim 66, further comprising:

at least a two-stage arrangement of electron lenses disposed between said detector and the irradiation location such that said detector is for detecting the electron beam after the electron beam passed through said two-stage arrangement of electron lenses.

73. (Previously presented) The electron beam system according to claim 66, further comprising:

an entrance pupil of an irradiation lens system disposed between said electron gun and the irradiation location such that a source image is formed in said entrance pupil.

74. (Previously presented) The electron beam system according to claim 66, further comprising:

two magnifying lenses disposed between the irradiation location and said detector, with a magnification of said two magnifying lenses being able to be made variable in response to a size of an irradiation area of the electron beam on the sample.

75. (Previously presented) The electron beam system according to claim 66, wherein said electron gun is for irradiating the electron beam against the sample by irradiating against the sample an electron beam having an irradiation area that is defined to be rectangular in shape, having long sides and short sides, and

said electron beam system further comprises a sample table, at the irradiation location, on which the sample is to be loaded, with said sample table being movable such that detection of the sample is performed by said detector while moving said sample table, having the sample loaded thereon, continuously in a direction of the short sides.

76. (Previously presented) The electron beam system according to claim 66, further comprising:

a sample table carrier for controlling the electron beam so as to perform a scanning motion in a step-by-step manner or continuously.

77. (Previously presented) The electron beam system according to claim 66, wherein said detector comprises

- (i) a scintillator that is to change the electron beam to an image of light,
- (ii) an optical lens for adjusting a size of the image of light as produced by said scintillator, or an optical system for projecting the image of light, and
- (iii) either one of a CCD detector or a TDI detector on which the image of light, whose size has been adjusted by said optical lens, is to be formed.

78. (Previously presented) The electron beam system according to claim 66, wherein said electron gun is an electron gun having a small source and having an FE, a TFE or a Schottky cathode.

79. (Previously presented) The electron beam system according to claim 66, wherein said electron gun is disposed under the irradiation location, and said detector is for detecting a defect in the sample, and is disposed above the irradiation location.

80. (Previously presented) The electron beam system according to claim 66, further comprising:

magnifying lenses, for magnifying the electron beam, disposed between said electron gun and said detector,

wherein a magnifying lens, serving as a first one of said magnifying lenses to magnify the electron beam that has passed through the sample, is a doublet lens.

81. (Previously presented) The electron beam system according to claim 66, further comprising:

magnifying lenses, for magnifying the electron beam, disposed between said electron gun and said detector, and

an NA aperture disposed between said magnifying lenses,

wherein said NA aperture is able to remove electron beams of a bad collimation that have been scattered by the sample.

82. (Previously presented) The electron beam system according to claim 77, further comprising:

a vacuum window arranged between said scintillator and said optical lens for removing the image of light when directed to said optical lens,

wherein said scintillator is disposed in a vacuum, and said optical lens and said CCD detector or TDI detector are disposed in an atmosphere.

83. (Previously presented) The electron beam system according to claim 77, wherein said scintillator, said optical lens and said CCD detector or TDI detector are disposed in a vacuum.

84. (Previously presented) The electron beam system according to claim 66, wherein said detector comprises an image detector, with said image detector being composed of an MCP and an EB-CCD detector or an EB-CCD, or otherwise an MCP and an EB-TDI detector or an EB-TDI.

85. (Previously presented) The electron beam system according to claim 66, further comprising:

a second detector for detecting secondary electrons or back scattering electrons, which are generated upon scanning of the sample with the electron beam, disposed between the irradiation location and said electron gun.

86. (Previously presented) The electron beam system according to claim 73, further comprising:

a two-stage arrangement of lenses between said electron gun and the irradiation location, wherein said electron lens is constructed and arranged such that by changing a focal length of said electron lens a crossover image can be formed so as to scan a sample surface of the sample with the crossover image, or by reducing an overlap between two shaping apertures the electron beam is made to have a small diameter so as to scan the sample surface of the sample with this electron beam, such that registration of the sample can be performed.

87. (Previously presented) The electron beam system in accordance with claim 66, wherein

a pixel processing rate for an image of said system is set to be equal to at least 200 MHz.

88. (Previously presented) The electron beam system according to claim 66, further comprising:

a storage unit in which reference pattern data is stored in advance; and

a control unit for comparing image data, obtained from the electron beam after having passed through the sample, to the pattern data,

wherein said control unit is to perform a defect inspection of the sample based on a comparison of the image data and the pattern data.

89. *(Canceled)*

90. *(Canceled)*

91. (Previously presented) A manufacturing method of a semiconductor device, comprising:

preparing wafers;

processing said wafers by performing a lithography process by employing a stencil mask which has been inspected for any defect by using the electron beam system according to claim 66; and

assembling devices using the processed wafers.

92. (Previously presented) An electron beam system comprising:

an electron gun for emitting a primary electron beam and irradiating the primary electron beam against a sample, when positioned at an irradiation location as a subject to be inspected, so

as to form an electron image, by a transmission electron beam having passed through the sample, to be magnified and detected;

an NA aperture disposed in a path of the transmission electron beam; and

an electron lens in the vicinity of the irradiation location,

wherein a principle plane of said electron lens and said NA aperture are in a conjugate relationship with respect to each other.

93. (Previously presented) The electron beam system according to claim 92, further comprising:

an optical axis; and

shaping apertures in the vicinity of said optical axis, with an overlapping arrangement of said shaping apertures being changeable so as to make variable an area on the sample to be irradiated by the primary electron beam when emitted from said electron gun.

94. (Previously presented) The electron beam system according to claim 92, further comprising:

a shaping aperture in a path of the primary electron beam when emitted by said electron gun,

wherein said shaping aperture and the sample, when positioned at the irradiation location, are arranged to be in a conjugate relationship relative to each other.

95. (Previously presented) An electron beam system comprising:

a two-stage arrangement of electron lenses for magnifying an electron image of secondary electrons emanated from a sample surface, back scattering electrons or an electron having passed through the sample so as to be detected,

wherein said two-stage arrangement of electron lenses includes a first stage electron lens and a second stage electron lens, with said first stage electron lens to produce a magnified image

that is to be focused on a certain point upstream of said second stage electron lens to thereby reduce a distortion aberration or a magnification aberration.

96. (Previously presented) The electron beam system according to claim 92, further comprising:

a two-stage arrangement of electron lenses in a path of the transmission electron beam, said two-stage arrangement of electron lenses including a first stage electron lens and a second stage electron lens, with said first stage electron lens to produce a magnified image that is to be focused on a certain point upstream of said second stage electron lens.

97. (Previously presented) An electron beam system, in which a primary electron beam is irradiated to a sample, and an image of secondary electrons emanated from the sample, an image of back scattering electrons or an image of transmission electrons having passed through the sample is magnified and detected as an image, wherein

a distortion aberration in the detected image is simulated by calculation to thereby determine a difference between a third order of absolute value and a fifth order of absolute value of the distortion aberration, and a compensation parameter is optimized such that the difference is minimized or that the fifth order of absolute value is greater than the third order of absolute value by about 5 to 15%, wherein a position of a magnified image produced by a first stage electron lens is to be set in response to the optimized compensation parameter.

98. (Previously presented) The electron beam system according to claim 95, wherein a distance between said second stage electron lens and the magnified image is a compensation parameter, and a position of the magnified image when produced by said first stage electron lens is to be set in response to the compensation parameter being optimized.

99. (Previously presented) An electron beam system comprising:
an electron gun for emitting an electron beam and for irradiating the electron beam against a sample when the sample is positioned at an irradiation location;
an electron lens disposed close to the irradiation location, said electron lens for magnifying, as a transmission electron image, electrons that have passed through the sample so as to be detectable by either one of a CCD, a TDI or an EBCCD; and
an NA aperture between said electron gun and said irradiation location, with an NA aperture image to be focused on or in the vicinity of a principle plane of said electron lens,
wherein when a magnification for magnifying the electrons is to be changed, a distance between the irradiation location and said electron lens is changed.

100. (Previously presented) The electron beam system according to claim 92, further comprising:
an adjuster for adjusting a distance between the irradiation location and said electron lens when one sample is replaced by another.